CLAIMS

What is claimed is:

1. An optical imaging system comprising:
   a) an illumination system providing a beam of light, the illumination system having an f/# less than or equal to 2.5;
   b) a Cartesian polarizing beam-splitter having a first tilt axis, oriented to receive the beam of light, wherein the Cartesian polarizing beam splitter nominally polarizes the beam of light with respect to the Cartesian beam-splitter, wherein a first polarized beam of light having a first polarization direction is folded by the Cartesian polarizing beam splitter and a second polarized beam of light having a second polarization direction is transmitted by the Cartesian polarizing beam splitter;
   c) a color separation and recombination prism optically aligned to receive one of the polarized beams of light, said prism having a second tilt axis, a plurality of color separating surfaces, and a plurality of exit surfaces, wherein the second tilt axis is oriented perpendicularly to the first tilt axis of the Cartesian polarizing beam-splitter so that the polarized beam is nominally polarization rotated into the opposite polarization direction with respect to the color separating surfaces and a respective beam of colored light exits through each of the exit surfaces; and
   d) a plurality of polarization modulating imagers, each imager placed at one of the exit surface of the color separating and recombining prism to receive one of the respective beams of colored light, wherein each imager can separately modulate the polarization state of the beam of colored light incident on said imagers.

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2. The optical imaging system of claim 1, wherein the first polarization direction is s-polarization and the second polarization direction is p-polarization.
3. The optical imaging system of claim 1, wherein the first polarization direction is p-polarization and the second polarization direction is s-polarization.
4. The optical imaging system of claim 1, wherein the illumination system provides a beam of substantially pre-polarized light.
5. The optical imaging system of claim 1, wherein the color separation and recombination prism includes at least three exit surfaces, and the plurality of imagers includes at least

three imagers, wherein each of the colored light beams is a different color and each imager receives one of the different color light beams.

6. The optical imaging system of claim 1, wherein each imager reflects a polarization modulated image, wherein each image enters the color separation and recombination prism and the prism recombines the images into a single combined image, wherein the combined image is transmitted by the Cartesian polarizing beam splitter.

7. The optical imaging system of claim 6, further comprising a projection lens assembly, wherein the combined image is projected by the lens assembly onto a surface for viewing.

8. The optical imaging system of claim 1, wherein the optical system is a front projection system.

9. The optical imaging system of claim 1, wherein the optical system is a rear projection system.

10. The optical imaging system of claim 1, wherein the color separation and recombination prism includes a Phillips prism.

11. The optical imaging system of claim 1, wherein the Cartesian polarizing beam splitter includes APF multilayer optical film.

12. The optical imaging system of claim 1, wherein the polarization modulating imagers include a LCOS imager.

13. A projection system comprising:

a) a Cartesian polarizing beam splitter, the Cartesian polarizing beam splitter defining a first tilt axis;

b) a color separation prism assembly, the prism assembly having a second tilt axis;

c) wherein the Cartesian polarizing beam splitter and the prism assembly are arranged such that the first and the second tilt axes are perpendicular to each other.

14. The projection system of claim 13, further comprising an illumination system providing a beam of light, the illumination system having an f/# less than or equal to 2.5.

15. The projection system of claim 13, wherein the projection system is a front projection system.

16. The projection system of claim 13, wherein the system is a rear projection system.

17. The projection system of claim 13, wherein the color separation prism assembly includes a Phillips prism.

18. The projection system of claim 13, wherein the Cartesian polarizing beam splitter includes APF multilayer optical film.

19. A projection engine for displaying an image, the projection engine comprising:

a) a Cartesian polarizing beam-splitter having invariant, generally orthogonal principal axes including a first tilt axis; wherein the Cartesian polarizing beam splitter reflects a first polarization component beam of an incident beam of light and transmits a second polarization component beam, the polarization of the separate component beams being referenced to the principal axes; and

b) a color separating prism assembly, optically aligned to receive one of the polarization component beams, the prism assembly having a plurality of color separating surfaces having tilt axes.

20. The projection engine of claim 19, wherein the tilt axes of its color separation surfaces are parallel to the first tilt axis of the Cartesian polarizing beam splitter.

21. The projection engine of claim 19, wherein the tilt axes of its color separation surfaces are perpendicular to the first tilt axis of the Cartesian polarizing beam splitter.

22. The projection engine of claim 19, further comprising an illumination system providing the incident beam of light, the illumination system having an f/# of at most 2.5.

23. The projection engine of claim 19, further comprising a plurality of imagers, wherein the prism assembly has a plurality of exit surfaces and each imager is optically aligned with respect to a corresponding exit surface.

24. The projection engine of claim 23,

a) further comprising a projection lens assembly;

b) wherein each imager is a polarization modulating reflective imager and the prism assembly is a color separating and recombining prism assembly;

c) wherein the prism assembly receives the one polarization component beam and separates the polarization component beam into a plurality of color beams;

d) wherein each color beam exits through a respective exit surface and a portion of the color beam is polarization modulated and reflected by the respective imager;

e) wherein the reflected portions of the color beams reenters the prism assembly and are recombined into a single image beam, the image beam being directed by the Cartesian polarizing beam splitter to the projection lens assembly, wherein the projection lens assembly projects an image.

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